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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Rudolf BUCK et al.

Date: February 13, 1998

Serial No.:

Filed: Herewith

For: TWIN WIRE FORMER

Hon. Commissioner of Patents and Trademarks  
Washington, DC 20231

REQUEST FOR CONTINUING APPLICATION UNDER 37 C.F.R. 1.53(b)

Sir:

This is a request for the filing of a Continuation application under the provisions of 37 C.F.R. 1.53(b) of pending application Serial No. 08/556,769, filed November 2, 1995, by Rudolf Buck, Dieter Egelhof, Klaus Henseler, Werner Wade, Albrecht Meinecke, Wilhelm Wanke and Hans-Jurgen Wulz entitled TWIN WIRE FORMER. The prior application is hereby incorporated by reference.

Enclosed is a copy of the prior application, including the oath or declaration as originally filed.

I hereby state that the attached papers are a copy of prior application Serial No. 08/556,769, filed November 2, 1995, without any new matter therein.

Cancel in this application original claims 2-30 of the prior application before calculating the filing fee.

The filing fee is calculated as follows:

BASIC Filing Fee:	.....	\$ 790.00
Number of Claims in Excess of 20:	_____ x \$22	.....
Number of Independent Claims over 3:	_____ x \$82	....
One or more multiple dependent claims:	\$270.....	\$_____
TOTAL FILING FEE:	.....	<u>\$ 790.00</u>

Check No. 73628 which includes the amount of \$790.00 in payment of the filing fee is enclosed herewith.

The Patent and Trademark Office is hereby authorized to charge any additional fees or credit any refund, at any time during the prosecution of this application, to Deposit Account No. 15-0700.

Amend the specification by inserting at page 1, line 3, after "entire disclosure of," --application Serial No. 08/556,769, filed November 2, 1995 now pending, which is a continuing--

This application includes two (2) sheets of drawings containing figures 1 through 5.

Priority under 35 U.S.C. §119 based on German Application No. P 39 27 597.3, filed August 22, 1989, is claimed. The certified copy of the priority application has been filed in said prior application Serial No. 08/055,918, filed April 29, 1993.

The prior application was assigned to J.M. Voith GmbH and is recorded at Reel 7973, Frame 0629.

The power of attorney in the prior application, as originally filed, is to customer no. 2352, OSTROLENK, FABER, GERB & SOFFEN, LLP, 1180 Avenue of the Americas, New York, New York 10036-8403, and the members of the firm: Reg. No. 17,542; Samuel H. Weiner, Reg. No. 18,510; Jerome M. Berliner, Reg. No. 18,653; Robert C. Faber, Reg. No. 24,322; Edward A. Meilman, Reg. No. 24,735; Stanley H. Lieberstein, Reg. No. 22,400; Steven I. Weisburd, Reg. No. 27,409; Max Moskowitz, Reg. No. 30,576; Stephen A. Soffen, Reg. No. 31,063; James A. Finder, Reg. No. 30,173; William O. Gray, III, Reg. No. 30,944; Louis C. Dujmich, Reg. No. 30,625, and Douglas A. Miro, Reg. No. 31,643, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent and Trademark Office in connection therewith and to

receive all correspondence. The Power appears in the original papers in the prior application.

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February 13, 1998

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TWIN WIRE FORMERRELATED APPLICATIONS

5 This is a continuing application of, and hereby  
incorporates by reference the entire disclosure of, application  
Serial No. 08/286,948, filed August 8, 1994 now pending, which is  
a continuing application Serial No. 08/055,918, filed April 29,  
1993, issued February 14, 1995 as Patent 5,389,206, <sup>0/62/301</sup> which is a  
continuing application Serial No. 07/773,965, filed November 12,  
10 1991, now abandoned.

BACKGROUND OF THE INVENTION

15 The present invention relates to a twin-wire former for  
the production of a fiber web, in particular a paper web, from a  
fiber suspension. The invention proceeds from the basis of the  
twin-wire former known from British Patent 1 125 906. The  
features indicated in the patent include a twin wire former for  
producing a fiber web and particularly a paper web from a fiber  
suspension. Two web forming wire belts, in the form of endless  
loops, travel together to form a twin wire zone. The web travels  
20 between and along the path of the wire belts through the twin  
wire zone. The twin wire zone has three sections and the elements  
in those three sections are described below. The patent describes  
features that state, in other words, that the forming of the  
fiber web from the pulp suspension fed from the headbox takes  
25 place exclusively between two wire belts. Thus, there is no  
so-called single-wire pre-drainage path. In a first section of  
the twin-wire zone, the two wire belts together form a  
wedge-shaped inlet slot; a jet of pulp slurry coming from the  
headbox discharges into it. The jet strikes the two wire belts at  
30 a place where they pass over a curved drainage element; in the  
case of the aforementioned British patent, this is a stationary,  
curved forming shoe. Its curved wire guide surface is formed of a  
plurality of strips with drainage slots between them. This

forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box).  
5 Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

10 It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as  
15 uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which  
20 pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation,  
25 a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

30 It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a stationary curved forming shoe developed in accordance with the aforementioned British Patent 1 125 906 counteracts the danger of reflocculation. This is true also of the drainage strips arranged in the British Patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not  
35 completely eliminated in the arrangement according to said British Patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region

of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI Proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

## SUMMARY OF THE INVENTION

5 The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

10 This object is achieved by the features set forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

The inventors have found that a combination of known features, namely:

- 25 A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- 30 B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- 35 C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported,

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duoformer D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duoformer D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide

roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

#### BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from

below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12-upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag"

arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II.

5 Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. 15 There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20. 20

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly 25 produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension. 30

35 For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I

of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible

even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which

deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against the bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and

58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about  $20^\circ$  with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone,

as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably  $n$  flexibly supported strips 27/57 and  $n + 1$  rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number  $n$  of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

## CLAIMS

What is claimed is:

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that strip contacts;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for  
35 collecting the water drained from the fiber suspension by all of  
the other drainage strips; and

the twin wire zone having a third section following the  
second section along the path of the wire belts through the twin  
wire zone; a second drainage element in the third section for  
40 being engaged by one of the wire belts as the wire belts travel  
over the second drainage element.

2. The twin wire former of claim 1, wherein the first  
drainage element is stationary.

3. The twin wire former of claim 2, wherein the first  
45 drainage element is curved and is engaged by one of the wire  
belts for curving the path of the belts around the curved  
drainage element after the entrance of the suspension into the  
entrance slot.

4. The twin wire former of claim 3, wherein the first  
drainage element has an open surface to enable drainage of water  
from the fiber suspension.

5. The twin wire former of claim 1, wherein the twin  
wire zone is free of rolls which deflect the twin wire zone.

6. The twin wire former of claim 1, wherein the twin  
wire zone is free of any forming rolls.

7. The twin wire former of claim 1, wherein the first  
drainage strips are located within the same wire belt loop as the  
first drainage element and the second drainage strips are located  
within the other wire belt group.

8. The twin wire former of claim 7, wherein the first  
one of the second drainage strips is located upstream of the  
first one of the first drainage strips and the last one of the

second drainage strips is located downstream of the last one of the first drainage strips.

9. The twin wire former of claim 1, further comprising means for supplying a vacuum in the area of the second drainage strips.

10. The twin wire former of claim 1, wherein each of the drainage strips has a respective "thickness in the direction along the path through the twin wire zone; neighboring ones of the first drainage strips are spaced a minimum distance of about three times the respective first strip thickness, and neighboring ones of the second drainage strips are also spaced a minimum distance of about three times the respective second strip thickness.

11. The twin wire former of claim 1, wherein the support means for the second drainage strips include means enabling adjustment of the position of the second drainage strips relative to the second wire belt to set the initial rigid position thereof.

12. The twin wire former of claim 11, wherein the support means for the second drainage strips comprise a support body to which the second drainage strips are supported, and bearings on which the support body is supported for enabling displacement of the support body across the path of the wire belts through the second section.

13. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of at least one of the first and second drainage strips individually, and means supporting the respective support body for each strip to be displaceable for enabling displacement of the respective strip transverse to the direction of the path of the wire belts.

14. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of the first and second drainage strips individually and means further supporting the respective support body of at least one of the first and second strips for enabling said at least one strip to be moved transverse to the direction of the path of the wire belts.

15. The twin wire former of claim 1, further comprising a curved stationary forming shoe in the first section of the twin wire zone and following after and spaced from the curved drainage element along the path of the wire belts through the first section;

a first section strip disposed at the second wire belt and in the space between the curved drainage element and the curved stationary forming shoe in the first section of the twin wire zone along the path of the wire belts through the twin wire zone for enabling removal of water from the second wire belt.

16. The twin wire former of claim 1, wherein the second drainage element in the third section of the twin wire zone is stationary.

17. The twin wire former of claim 16, wherein the second drainage element is curved.

18. The twin wire former of claim 17, wherein the second drainage element has a curvature that is curved in the same direction as the curvature of the curved drainage element in the first section of the twin wire zone.

19. The twin wire former of claim 18, further comprising an additional strip in the third section of the twin wire zone following the second drainage element and disposed against the other wire belt than the stationary drainage element.

20. The twin wire former of claim 18, wherein the first drainage element in the first section of the twin wire zone and the second drainage element in the third section of the twin wire zone are arranged against the same one of the first and second wire belts.

21. The twin wire former of claim 1, further comprising a suction roll at one of the wire belts and located after the first drainage element along the path of the wire belts; both of the wire belts being wrapped about part of the circumference of the suction roll.

22. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises substantially vertically upwardly in the path of travel of the wire belts through the twin wire zone.

23. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises gradually upwardly along the path of travel of the wire belts through the twin wire zone at an incline with respect to the horizontal in the range of about 10° to 30°.

24. The twin wire former of claim 1, wherein the first and the second drainage strips in the second section of the twin wire zone are both arranged one after the other along the path of the wire belts through the twin wire zone so as to define a curvature for the path of the wire belts through the second section.

25. The twin wire former of claim 14, wherein the first and second drainage strips are positioned in the second section of the twin wire zone to define a curvature for the path of the wire belts through the second section of the twin wire zone that is opposite the curvature of the curved drainage element in the first section of the twin wire zone.

26. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone extends substantially horizontally;

the first drainage element in the first section of the twin wire zone being generally curved upwardly for giving the path of the wire belts through the first section of the twin wire zone a generally upward curve; the first and second drainage strips in the second section of the twin wire zone being so positioned as to give the wire belts a generally downward curvature through at least part of the second section of the twin wire zone and the stationary drainage element in the third section of the twin wire zone is curved in a direction to give the wire belts passing through the third section of the twin wire zone a generally upward curvature.

27. The twin wire former of claim 1, wherein the stationary drainage element is curved.

28. The twin wire former of claim 1, wherein the stationary drainage element includes means for providing suction thereto to facilitate drainage of water.

29. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and

15 directed for delivering fiber suspension from the headbox to the  
wedge shaped entrance slot of the first section of the twin wire  
zone;

the twin wire zone having a second section following  
the first section along the path of the belts through the twin  
20 wire zone; in the second section, a plurality of first drainage  
strips are positioned within the loop of the first wire belt and  
are for contacting the first wire belt; in the second section, a  
plurality of second drainage strips are positioned within the  
loop of the second wire belt and are for contacting the second  
25 wire belt; the first strips being shifted in position along the  
path of the wire belts with respect to the second strips so that  
the first and second strips are offset and in a non-opposing  
relationship; first support means for resiliently supporting the  
first drainage strips against the respective wire belt that strip  
30 contacts, the last one of the second drainage strips being  
located downstream of the last one of the first drainage strips;

second support means supporting the second drainage  
strips rigidly against the second wire belt;

the twin wire zone having a third section following the  
35 second section along the path of the wire belts through the twin  
wire zone; a drainage element in the third section for being  
engaged by one of the wire belts as the wire belts travel over  
the drainage element, the drainage element having an open surface  
to enable water to be drained through the wire belt in contact  
40 therewith; and

the twin wire zone being free of rolls which deflect  
the twin wire zone.

30. A twin-wire former for the production of a paper  
web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for  
directing the wire belts to travel along a path together for  
5 forming a twin wire zone of the twin wire former, with the web  
between the wire belts as the wire belts travel along the path

through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

10 the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and  
15 directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

20 the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second  
25 wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that strip  
30 contacts, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

35 the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element; and

the twin wire zone being free of any forming rolls.

ABSTRACT OF THE DISCLOSURE

5 In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

UNITED STATES OF AMERICA  
COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR CONTINUING APPLICATION

OPGS FILE NO.  
P/14-363

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TWIN WIRE FORMER

the specification of which

☐ is attached hereto.

☒ was filed on 11/02/95 as United States Patent Application Serial No. 08/556,769

☐ was filed on \_\_\_\_\_ as PCT international application No. \_\_\_\_\_

and was amended on 02/07/96 (if any).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by the amendment referred to above.

I acknowledge my duty to disclose all information known to be material to patentability, pursuant to Title 37, Code of the Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Germany	P 39 27 597.3	08/22/89	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

07/773,965	November 12, 1991	Abandoned
(Application Serial No.)	(Filing Date)	(Status)
08/286,948	August 8, 1994	Pending
(Application Serial No.)	(Filing Date)	(Status)
08/055,918	April 29, 1993	Issued
(Application Serial No.)	(Filing Date)	(Status)

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			<input type="checkbox"/> Yes <input type="checkbox"/> No

UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR CONTINUING APPLICATION		OFCS FILE NO. P/14-363
<p>I hereby appoint OSTROLENK, FABER, GERB &amp; SOFFEN and the members of the Firm, Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent &amp; Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO: OSTROLENK, FABER, GERB &amp; SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 DIRECT TELEPHONE CALLS TO: (212) 382-0700</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>		
Full name of Sole or First Inventor <b>Dieter Egelhof</b>	Inventor's Signature	Date
Residence <b>D-7920 Heidenheim</b>	Country of Citizenship <b>Germany</b>	
Post Office Address <b>Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany</b>		
Full name of Second Joint Inventor <b>Klaus Henseler</b>	Inventor's Signature	Date
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Post Office Address <b>Wildstr. 20, D-7920 Heidenheim, Germany</b>		
Full name of Third Joint Inventor <b>Werner Kade</b>	Inventor's Signature	Date <b>5/20/96</b>
Residence <b>Neenah, Wisconsin 54956</b>	Country of Citizenship <b>Germany</b>	
Post Office Address <b>521 Harbor Light Court, Neenah, Wisconsin 54956, USA</b>		
Full name of Fourth Joint Inventor <b>Albrecht Meinecke</b>	Inventor's Signature	Date
Residence <b>D-7920 Heidenheim</b>	Country of Citizenship <b>Germany</b>	
Post Office Address <b>Hans-Holbein-Str. 39, D-7920 Heidenheim, Germany</b>		
Full name of Fifth Joint Inventor <b>Wilhelm Wanke</b>	Inventor's Signature	Date
Residence <b>D-7920 Heidenheim</b>	Country of Citizenship <b>Germany</b>	
Post Office Address <b>Donauschwabenstr. 47, D-7920 Heidenheim, Germany</b>		

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CONTINUED ON PAGE 3

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COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR CONTINUING APPLICATION

OPGS FILE NO.  
P/14-363

I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm. Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faher—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.

SEND CORRESPONDENCE TO:

OSTROLENK, FABER, GERB & SOFFEN  
1180 AVENUE OF THE AMERICAS  
NEW YORK, NEW YORK 10036-8403  
DIRECT TELEPHONE CALLS TO: (212) 382-0700

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of 6th Inventor	Inventor's Signature	Date
Hans-Jurgen wulz		
Residence	Country of Citizenship	
D-7920 Heidenheim	Germany	
Post Office Address		
Inselstr. 11, D-7920 Heidenheim, Germany		
Full name of 7th Inventor	Inventor's Signature	Date
Rudolf Buck *		
Residence	Country of Citizenship	
D-7920 Heidenheim	Germany	
Post Office Address		
Schlosshastr. 53, D-7920 Heidenheim, Germany		

BY HIS LEGAL REPRESENTATIVE

Mrs. Else Buck

\* By his legal representative

UNITED STATES OF AMERICA  
COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR CONTINUING APPLICATION

OFGS FILE NO.  
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As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verify believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: \_\_\_\_\_

**TWIN WIRE FORMER**

the specification of which

☐ is attached hereto.

☒ was filed on 11/02/95 as United States Patent Application Serial No. 08/556,769

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			<input type="checkbox"/> Yes <input type="checkbox"/> No

**UNITED STATES OF AMERICA**  
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**FOR CONTINUING APPLICATION**

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P/14-363


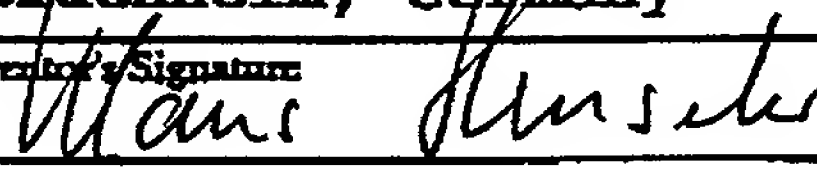
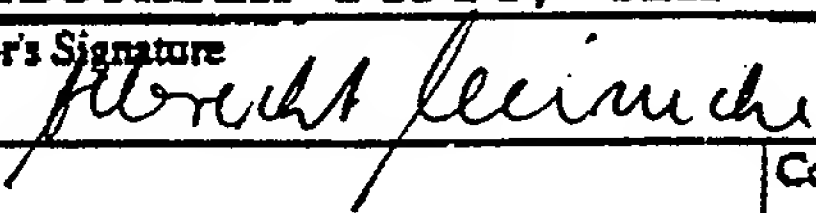

I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm. Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.

**SEND CORRESPONDENCE TO:**

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**1180 AVENUE OF THE AMERICAS**  
**NEW YORK, NEW YORK 10036-8403**

**DIRECT TELEPHONE CALLS TO: (212) 382-0700**

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Full name of Sole or First Inventor <b>Dieter Egelhof</b>	Inventor's Signature 	Date <b>MAY 22. 1996</b>
Residence <b>D-7920 Heidenheim</b>		Country of Citizenship <b>Germany</b>
Post Office Address <b>Lucas-Cranach-Str. 15, D-7920 Heidenheim, Germany</b>		
Full name of Second Joint Inventor <b>Klaus Henseler</b>	Inventor's Signature 	Date <b>24.05.96</b>
Residence <b>D-7920 Heidenheim</b>		Country of Citizenship <b>Germany</b>
Post Office Address <b>Wildstr. 20, D-7920 Heidenheim, Germany</b>		
Full name of Third Joint Inventor <b>Werner Kade</b>	Inventor's Signature	Date
Residence <b>Neenah, Wisconsin 54956</b>		Country of Citizenship <b>Germany</b>
Post Office Address <b>521 Harbor Light Court, Neenah, Wisconsin 54956, USA</b>		
Full name of Fourth Joint Inventor <b>Albrecht Meinecke</b>	Inventor's Signature 	Date <b>28.5.96</b>
Residence <b>D-7920 Heidenheim</b>		Country of Citizenship <b>Germany</b>
Post Office Address <b>Hans-Holbein-Str. 39, D-7920 Heidenheim, Germany</b>		
Full name of Fifth Joint Inventor <b>Wilhelm Wanke</b>	Inventor's Signature 	Date <b>20. May 1996</b>
Residence <b>D-7920 Heidenheim</b>		Country of Citizenship <b>Germany</b>
Post Office Address <b>Donauschwabenstr. 47, D-7920 Heidenheim, Germany</b>		

OFGS FORM DE2 (790)

UNITED STATES OF AMERICA  
COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR CONTINUING APPLICATION

OFCS FILE NO.  
P/14-363

I hereby appoint OSTROLENK, FABER, GERB & SOFFEN and the members of the Firm. Marvin C. Soffen—Reg. No. 17,542; Samuel H. Weiner—Reg. No. 18,510; Jerome M. Berliner—Reg. No. 18,653; Robert C. Faber—Reg. No. 24,322; Edward A. Meilman—Reg. No. 24,735; Stanley H. Lieberstein—Reg. No. 22,400; Steven I. Weisburd—Reg. No. 27,409; Max Moskowitz—Reg. No. 30,576; Stephen A. Soffen—Reg. No. 31,063; and James A. Finder—Reg. No. 30,173, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.

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Full name of 6th Inventor	Inventor's Signature	Date
Hans-Jürgen Wulz	<i>H. J. Wulz</i>	20 May 96
Residence		Country of Citizenship
D-7920 Heidenheim		Germany
Post Office Address		
Inselstr. 11, D-7920 Heidenheim, Germany		
Full name of 7th Inventor	Inventor's Signature	Date
Rudolf Bück *		
Residence		Country of Citizenship
D-7920 Heidenheim		Germany
Post Office Address		
Schlosshastr. 53, D-7920 Heidenheim, Germany		

BY HIS LEGAL REPRESENTATIVE

*the date 20 May 96*  
Mrs. Else Bück

\* By his legal representative

0466720 342260

Fig.1

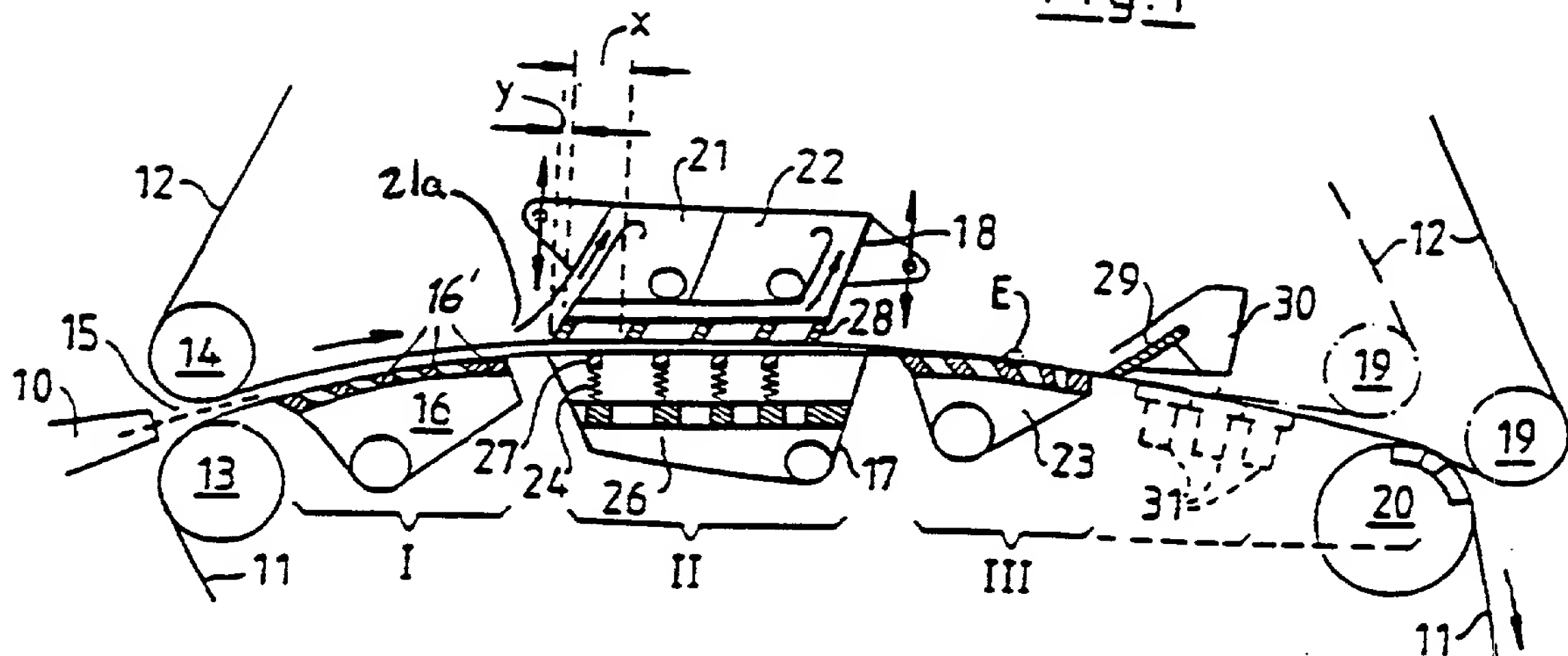


Fig.2

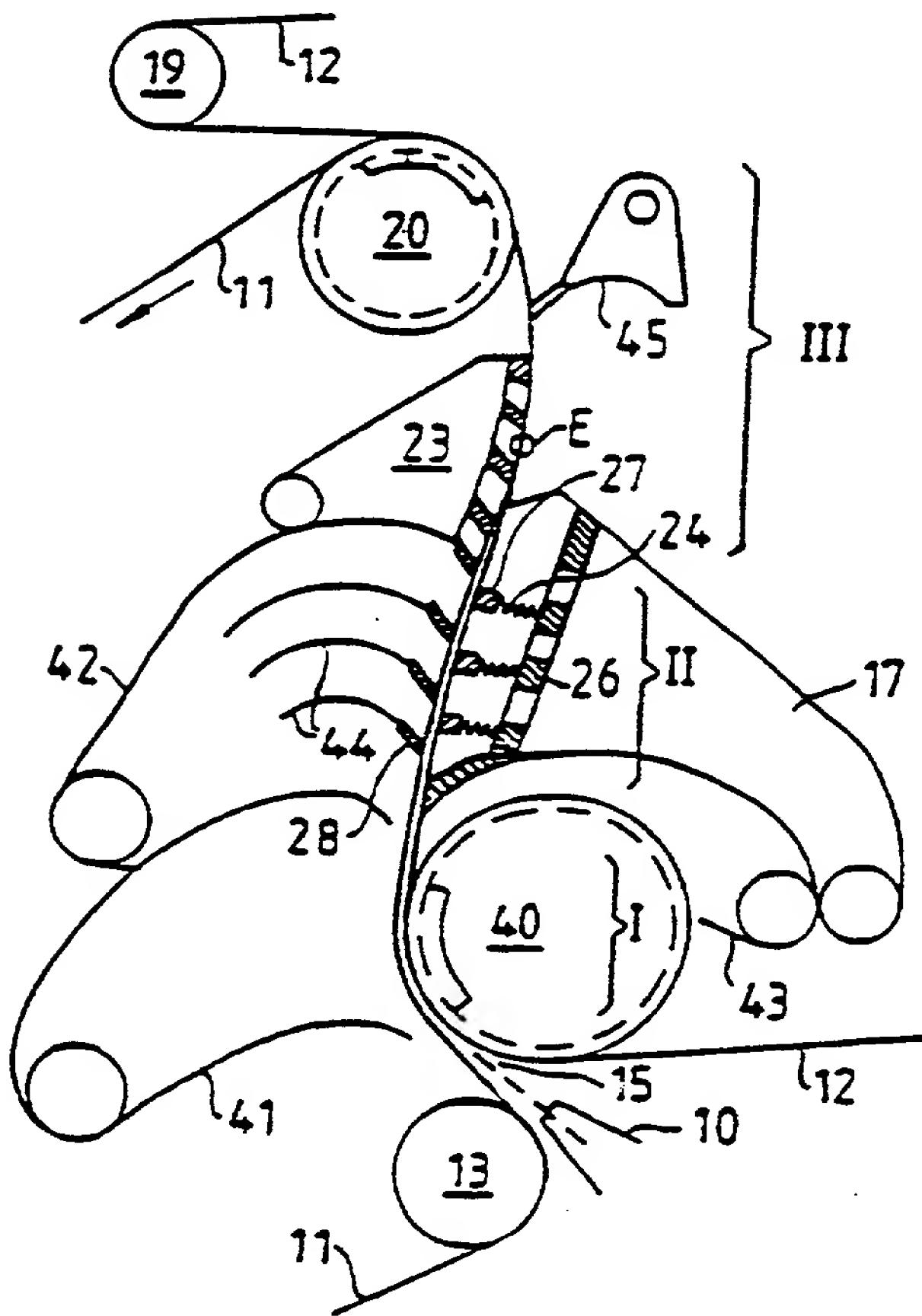


Fig.3

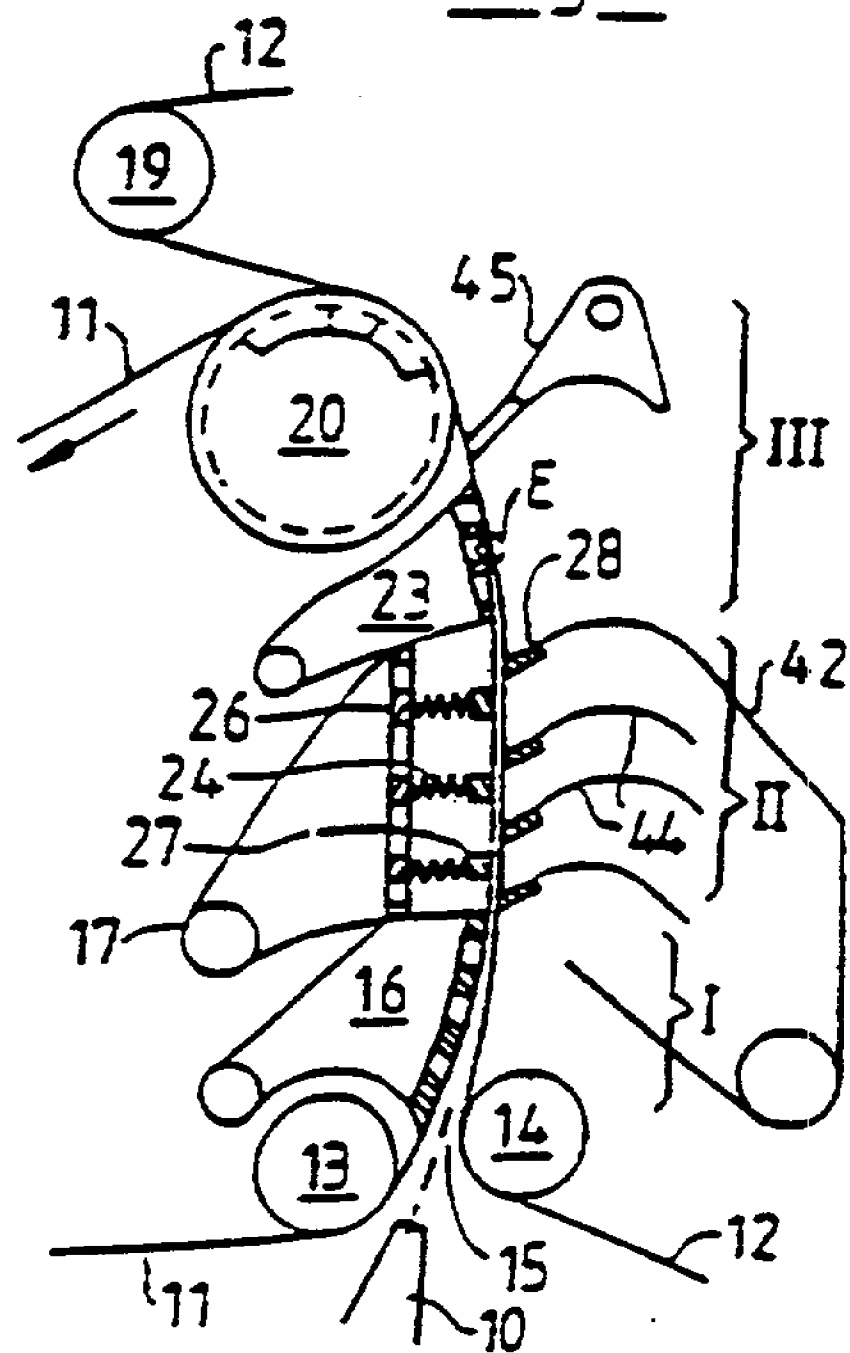


Fig.4

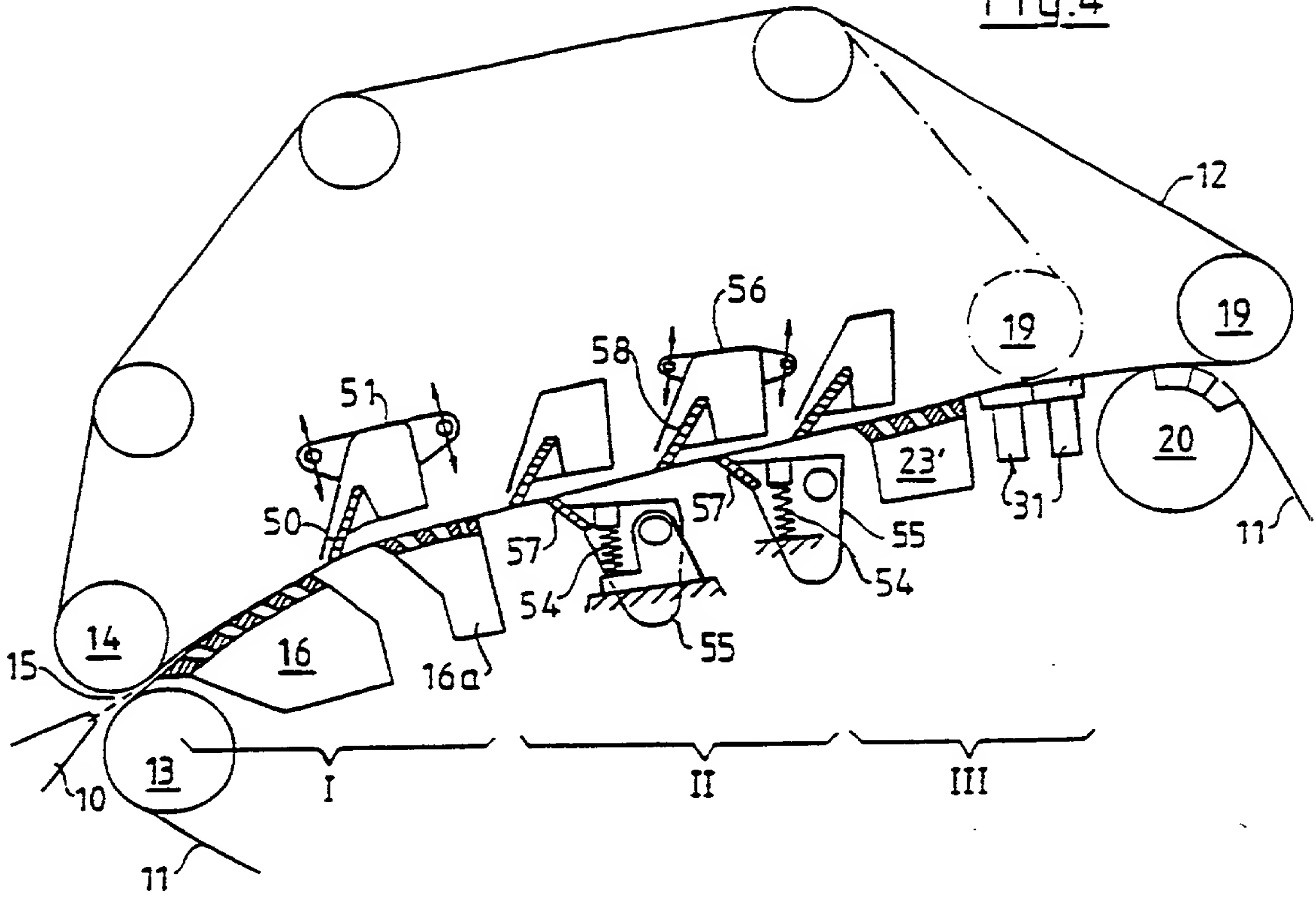


Fig.5

